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ORIGINAL COMMUNICATIONS.

THE BACTERIA.

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Continued from page 91.

Accepting, then, their plant nature, and leaving naturalists to settle their exact phylogenitic relationship, let us proceed to a consideration of some of their most prominent characteristics. No other living things in nature are so widely distributed throughout the world. "So commonly and multitudinously present, near us, and on us, and in us, as the various microscopic organisms of which we write, in countless numbers they exist in all filth, in decomposing vegetable and animal matter, ill-scented or not; in all organic substances undergoing so-called spontaneous change; and wherever we find those changes known as fermentation and decay, we find the special home of peculiar kinds." Upon cooked articles of food left for some time they form a slimy, colorless or colored coating which, even with the naked eye, is easily distinguished from the snow-white web-like mould fungus, with its spore powder of blue and white.

"Brewers' yeast, used in bread-making, is not a *bacterium*, but is a

related growth; and the so-called self-rising yeast, not unfrequently used in making bread, owes its energy to living bacteria. Sour milk always contains swarms of the microscopic moving things; and in the formation of vinegar from the juice of fruits, or from solutions of spirit and sugar, they are always present in vast numbers. They are invariably present in pus from open, suppurating wounds; in the discharge from boils and tumors, on and in our own bodies, and in the ill-scented accumulations of the body excretions. No one would wonder why the breath sometimes smells bad if the material collecting on the teeth, or the fur on the tongue, could be seen under a good microscope. The cleanest human mouth can hardly be said to be ever perfectly free from these active organisms; while those mouths to which the tooth-brush or its equivalent is a stranger, are the veritable culture boxes, or hot-houses, richly supplied with rapidly growing and prodigiously multiplying forms and kinds."

History tells us that from time to time a drop of blood would form on food, and especially bread, which increased rapidly, spreading over large surfaces. This occurring in ancient times, to the myth-forming fancy of the people, it was believed to be the sign of threatened disaster, showing the anger of God, disclosing secret guilt and calling for bloody atonement; and history records numberless sacrifices which till recent times fell to this superstition, as often as this wonder of blood was seen on food, but especially if on the consecrated wafer. A century of enlightenment has passed, and the blood wonder has gradually ceased; but with only the last few years do we know that the wonderful account had foundation in a fact of science. We now know the red slime to be composed of numberless little oval bodies—red spherical bacteria. They nourish themselves on the albumen contained in the food on the surface of which they develop, decompose the same, and generate by a peculiar pigmentary fermentation the red coloring matter, which possesses a striking relation to that brilliant aniline color, which is of so much value to the coloring industry.

Bacteria are killed by a temperature of 140° F., only the temperature must continue long enough to make sure that the whole mass has been penetrated, and not a single bacterium has escaped destruction. If the bacteria in a solution are killed and the introduction of new germs prevented, the liquid remains unchanged and putrefaction never takes place. Thus it is concluded from experiments often repeated, and always with the same results, that putrefaction does not take place if no bacteria are present; and, on the other hand, the multiplication

of them cease as soon as the substances capable of producing putrefaction are destroyed. Therefore, bacteria are not the chance companions, but rather the cause, of putrefaction, which may be defined to be "a chemical process excited by bacteria." *Death does not, as is generally supposed, cause putrefaction, but rather it is caused by the life of these invisible organisms.* The ancients believed that Apollo in his anger darted invisible arrows among his enemies, "prostrating men and cattle." The savage nations attribute diseases and scourges of the human race to the influence of evil spirits. "Thus extremes often meet." What human intelligence at first suspected, in its early attempts to reason from cause to effect, has been verified by the same intelligence in its higher development. Again, we have come to a belief in evil spirits; but these destroyers have assumed a tangible shape.

Leeuwenhock had scarcely made known his first observations upon the invisible creatures in putrid water before the physicians of his day began the promulgation of the theory that the frightful enigma of epidemic diseases was explained through the wafting of microscopical diseased germs. The discovery of these low forms of life in the mouth is not of modern origin, as we can see by the following extract from the writings of Leeuwenhock, written in 1682, at the age of fifty years. He says: "It is my custom every morning to rub my teeth with salt and afterward to wash my mouth, and after eating I always clean my large teeth with a tooth-pick and sometimes rub them very hard with a cloth. By this means my teeth are so clean and white that few persons of my age can show so good a set; nor do my gums ever bleed, although I rub them very hard with salt; and yet I cannot keep my teeth so clean but that, upon examining them with a magnifying-glass, I have observed a kind of white substance collected between them, in consistence like a mixture of flour and water. In reflecting on this substance, I thought it probable (though I could not observe any motion in it) that it might contain some living creatures. Having therefore mixed it with water which I knew was perfectly pure, I found to my surprise that it contained many small animalcules, the motion of which were very pleasing to behold. The largest sort of them had the greatest and quickest motion, leaping about the liquid like the fish called a jack; the number of these were very small. The second sort had a kind of whirling motion, and sometimes moved in the direction of a spiral and undulating; these were more in number. Of the third sort, I could not well ascertain the figure, for sometimes

they seemed roundish, but oblong, and sometimes perfectly round. These were so small that they did not appear larger than a speck. The motion of these little creatures, one among another, may be imagined like that of a great number of gnats or flies sporting in the air. From the appearance of these to me, I judged that I saw some thousands of them in a portion of liquid no larger than a grain of sand, and this liquid consisted of eight parts water and one part of the beforementioned substance taken from the teeth. With the point of a needle I took some of the same kind of substance from the teeth of two ladies who I knew were very punctual in cleaning them every day, and therein I observed as many of these animalcules as I have just mentioned. I also saw the same in a white substance taken from the teeth of a boy about eight years old, and upon examining in like manner the same substance taken from the teeth of an old gentleman, who was very careless about keeping them clean, I found an incredible number of living animalcules swimming about more rapidly than any I had before seen, and in such numbers that the water which contained them (though a small portion of the material taken from the teeth was mixed with it) seemed to be alive."

When we consider that this description was penned two hundred years ago, and at a time when microscopy was little known, and the compound microscope had not then been invented, we can but acknowledge the truth of the text—"There is no new thing under the sun."

I received in January, 1882, a letter enclosing a slip cut from the Boston *Globe*, bearing date of December 16, 1881, which announced in flaming head lines, *A new dental theory—The decay of teeth due to the ravages of bacteria—Excavation and teeth-filling soon to be superseded—Myriads of animalculæ playing tag between our teeth.*

The writer of the note accompanying this slip, says: "It seems that, after all, the botanists are at fault with their classification; *plants* don't play tag, neither do they swallow each other just for amusement. This 'New Yorker' has 'knocked' a big hole in somebody's theories." I read the article carefully, and was satisfied that either this Dr. Clark, spoken of in the article, was a myth, or the reporter had taken upon himself the task to describe things with which he was not familiar, and had become "mixed." After thinking the matter over, I wrote Dr. Clark, and in due time received the following reply: "I was interviewed several times last winter, and particularly by the writer to whom you refer, who seemed to be highly interested in my microscopical

investigations, but as a student of bacteria you know how easy it is to get these little organisms out of place and your investigations unintentionally misrepresented. I have been at work on bacteria of the mouth at different times for about twenty years, and have written several papers, the last read before the American Convention at Saratoga. In this paper as well as the former ones, I took the ground that caries of the teeth is caused by bacteria. Through fermentation one organism after another is introduced, until the final one of putrefaction, *B. termo*, is brought into action. The bioplasm of the dentine becomes nutritive pabulum, and when this is absorbed, little but lime-salts and fragments of bacteria are left."

Here, then, we find two land-marks, two hundred years apart, 1682–1882. Let us turn back and find what has been done by other investigators between these dates. Before entering upon this part of our subject, we wish to acknowledge our indebtedness to Dr. Thomas H. Chandler for his excellent translation of the investigations of Drs. Leber and Rottenstein, from which we obtain the following facts:

The ancient physicians, the dentists of their time, who engaged in inquiry of the causes of dental caries, confined themselves to making hypotheses more or less ingenious, and then founded them on experience and clinical observation. True investigation could only become possible when the histological structure of the dental tissues was known. Two hypotheses held a balanced sway—one, *chemical*, explained caries by the action of chemical agents, acids in particular; the other, *vital*, considered it as a veritable malady, caused by an organic change, and the reaction of the dental tissues against an external irritation. These different opinions remain to-day unsolved in spite of the researches which have been made on the subject. As early as 1846, Ficinus and Klencke entertained the idea that caries of the human teeth was in some way influenced by the lower forms of life, which may always be found in the oval cavity. Ficinus attributed dental caries to a putrefaction produced by the minute animalcules of the mouth, and to which he gave the name, *Denticola*. These, he maintained, attacked the enamel cuticle, consumed the enamel itself, and afterward the dentine. The investigations of M. Klencke were published a little later, in which he adopts several opinions offered by M. Ficinus, and sub-divides caries into three kinds: First, Soft caries, caused by putrefaction; Second, A soft caries, due to the proliferation of a vegetable called "*protococcus dentalis*" (later observers have failed to identify this parasite); Third, The so-called dry caries, caused by chemical action

of acids on the dental tissues, with which the parasites have nothing to do. Soon after Mr. J. Tomes published, and for the first time in the history of dentistry, accurately described the histological alteration of the dental tissues in caries. Then comes the observations of M. E. Newman. These observations bear almost exclusively upon the caries of dentine; that this affection has in part an inflammatory nature; that the injurious agents irritate the dentine and produce phenomena of organic irritation, which end by causing the destruction of the tissue.

At the beginning of the year 1868 appeared the "Treatise upon Dental Caries," by M. E. Magitot. This author attempts to prove that the acid contained in the saliva, or mixed with it, is the cause of dental caries, and that the nature of this affection is consequently purely chemical. He does not even mention the alterations described by Tomes and Newman, and contents himself with saying that the canaliculi contain sometimes a finely granulated substance. He attaches great importance to the calcareous deposits in the interior of the canaliculi, and considers them as the result of secretion from the irritated pulp. While the enamel is disappearing under the action of acids, the irritation is conveyed across the dentine even to the pulp which, reacting, throws out a calcareous exudation.

The same year, Drs. Leber and Rottenstein published "An Investigation into the Influence of Fungi in the Destruction of the Teeth." These investigators concluded that the action of an acid, or acids, was not sufficient to explain all the phenomena associated with caries of the teeth, but that the elements of the fungus (leptothrix) easily work their way into the dental tubuli, which they expand, and thereby assist the penetration of acids into the deeper parts.

In Johnston's Dental Miscellany, for 1879, page 447, will be found an article by Dr. F. Y. Clark, in which he states the belief that decay of the teeth is produced by what he calls "dental bacteria," which he describes as having an almost imperceptible screw-like motion.

A. Weil is of the opinion that the leptothrix bores directly through Nasmyths's membrane, and then into the enamel.

Arthur S. Underwood and W. J. Milles consider that caries, as well as suppuration of the pulp and alveolar abscess, depends upon the presence and proliferation of micro-organisms. These organisms attack first the organic material and, feeding upon it, create an acid, which remove the lime-salts. These investigators are without doubt the leaders in the researches upon this subject now going on on both

sides of the Atlantic. They are engaged at present upon a series of investigations which, when completed, will shed new light upon this problem.

Following closely in the footsteps of Underwood and Milles, verifying and extending their experiments, we have Dr. W. D. Miller, of Berlin, Germany. This gentleman has done more than any one else to bring the germ theory of dental caries to the notice of the dental profession. We give in his own words the summary of his paper published in the January (1883) number of the *Cosmos:*

"The general results arrived at may be summed up in the following paragraphs, partly in accordance with and partly contrary to the commonly accepted views:

1. The first stage of caries of the teeth, *i. e.*, the extraction of the lime-salts, is for the most part caused by those acids which are generated in the mouth by fermentation.

2. Decalcification of the enamel signifies total destruction of that tissue; of the dentine there remains after decalcification a tough, spongy mass, which becomes subject to the invasion of enormous numbers of fungi (leptothrix-threads, baccilli, micrococci, etc.).

3. The leptothrix-threads are found, with rare exceptions, only upon the surface, or in the superficial layers of the softened dentine, and appear to take but a small part in the invasion. The bacilli, on the other hand, penetrate far into the dentine, even into the finest branches of the canaliculi. Micrococci penetrate furthest.

4. In the separate tubules is frequently to be seen a gradual change from leptothrix-threads to long bacilli, from long to short bacilli, and from the latter to micrococci.

5. The fungi produce anatomical and pathological changes in the deeper layers, stop up the canaliculi, and necessarily lead sooner or later to the death of the dentinal fibrils. The outer layers of dentine, thereby deprived of nourishment, die and fall a prey to putrefactive agents.

6. The invasion of the fungi is always preceded by the extraction of the lime-salts.

7. The fungi have not the power either to penetrate or to decalcify sound dentine, so that the infection of a perfectly sound tooth by a carious one seems to be excluded.

8. We may accordingly look upon caries of the teeth as consisting of three stages: (1) decalcification; (2) infection and devitalization of the decalcified dentine; (3) putrefaction of the devitalized den-

tine; though it would not be easy to say just where one stage ceases and the other begins.

9. I have in a number of cases been able to establish the participation of the fungus saccharomyces mycoderma (?) in the carious process.

I do not, however, wish to be understood as saying that acids or pathogenic bacteria, or putrefactive bacteria, or all together, are the sole and only cause of decay of the human teeth. What I am prepared to say is this, that in my opinion there is not a single case of caries in which micro-organisms do not play some part, and that in the most cases they play a very important part."

Dr. Miller has changed his views somewhat since writing the above paper, and to those who wish to keep pace with the subject, it will repay them to study his several papers published since.

Dr. C. T. Stockwell, of the NEW ENGLAND JOURNAL OF DENTISTRY, in a paper read at the Saratoga Meeting of the American Dental Convention, August, 1883, says: "Much of the misunderstanding on the part of the opponents of the germ theory arises from the lack of a clear, concise and sharp definition of caries, or from a confusion of ideas produced by not recognizing a distinction between predisposing causes and real caries itself." He asks: "What, then, is true dental caries? The question is not: What are the exciting causes, neither is it: What the predisposing conditions? But recognizing all these, where and at what stage of the process does real caries begin?" Here he takes exception to much of the language that has been heard in nearly every meeting in which this subject has been discussed. He claims that the simple or direct result of abrasion, erosion, lowered vitality, *effect of medicines*, acids, etc., *without the intervention of some other factor, is not caries.* He then makes this assertion: "*Dental caries does not begin until the putrefactive process of an organic portion of a tooth is set up.*" You will see by this definition that a clear distinction is intended between fermentation and putrefaction. He does not use the term fermentation in this connection, but says that both processes are impossible when the *micro-organisms* are eliminated. So, while the advocates of the acid theory—acids resulting from fermentation of food substances in the mouth—claim their process as the true one, they should not lose sight of the rôle of micro-organisms in the production of fermentation; while the *chemical theory*—"*grossly so*"—better known as the "pickling" process, is no longer advocated, for it is now known that bacteria are always on hand where any "pick-

ling" is to be done. If they are destroyed by antiseptics, no caries follow.

Then follows a review of the microscopical investigations and investigators. As the pioneers in this branch of investigation, he very justly places the names of Underwood and Milles; then comes Miller, confirming and verifying their observations, though entering into *details* to the greatest extent of any one who has preceded him. So far as his observations have been published, he does not materially controvert the observations of Underwood and Milles. But the deductions based on these observations differ with the two observers, and this is, as to the details of the action of the *micro-organisms* present in all cases of decayed dentine. In answer to the query, "What is the condition of decayed dentine as shown by the most recent investigations?" we have, First, An outer layer, very irregular on its inner border, of infected dentine in which micro-organisms abound to a greater or less extent and to a greater or less depth; this is succeeded by a territory of varying depth free from organisms, but in a "softened" condition, as Dr. Miller terms it; beyond this layer is the non-affected or healthy dentine. This zone, this "terra incognita," situated between the carrious and healthy dentine, changed by something, but not infected, is the battle-ground at the present time given over to the war of "discussion and hypothesis." Perhaps one other question should be included —the invasion of perfectly normal tissue without the previous action of an acid to open the way to the dental fibrils, or at least, to the interstices between the enamel rods. The trouble would be apparent in attempting to answer the question, "What is perfectly formed enamel?" However perfect it may be to the unaided eye, under the glass it would oftentimes be found far from perfect. Allusion is made to the general misunderstanding of the position held by those who claim that *micro-organisms* are an essential factor in dental caries. The claim is, that the effect ***simply*** of acids is not ***caries***, that some other agent must come in before what is *properly* termed dental caries can take place, and that is micro-organisms. While admitting the action of acids, all such action should be classed with the *predisposing conditions favorable to* caries. The action of acids alone cannot be considered a part of the process of true caries any more than a *congenital defect* or a *fracture* can be so considered. In other words, caries does not begin until the *putrefactive* process of an organic portion of a tooth is set up, and this process is dependent upon the action of low organisms.

So much for the literature of the subject. After this examination, we find ourselves in the position of the student who entered the old hall of the Sorbonne, in company with the Genevian Professor, Casaubon. "Here," said the student, proudly, "is a building in which men have disputed for more than four hundred years." "And," asked Casaubon, "*what has been settled?*" There is a significance in the question of the old professor. No question of this kind can be settled by a war of words. Patient, continued research, in which all who can should take part, will in time bring forth good results. In all of the discussions that we have read in your journals since the germ theory of dental caries has been brought forward, we have noticed that the opponents, and sometimes the supporters, of the theory came to the work without any definite knowledge of the life-history of the bacteria. In order to find out what these organisms are responsible for, we must first find out their true place in the economy of nature. We hear people talking of bacteria of the "mouth" and "teeth" as though they were especially created for the sole purpose of tormenting the patient and bothering the dentist, and endowed with no other object in life but to bore, break down and destroy our teeth from a spirit of innate wickedness with which they are possessed. If these persons would study the full meaning of the extract which stands at the beginning of this paper, and make themselves familiar with the biological history of the bacteria as they exist elsewhere, following carefully the rôle they perform in the world of organized beings, the company of honest doubters would be less.

Gentlemen, in leaving this subject, we hope that enough has been said to induce you to follow out this inquiry in the spirit of true investigation. Observe carefully what is going on each day before your eyes. Compare these observations with others working in the same field. Reflect upon the data obtained, and learn if possible the lessons taught, remembering that "He who never walks save where he sees men's tracks, makes no discoveries." And, lastly, keep a record of each day's progress, as it is by these written records that the march of progress is made universal.

CRITICAL REMARKS UPON THE MISSTATEMENTS AS TO INTERDENTAL SPLINTS, IN THE SURGICAL TREATISE OF PROFESSOR D. HAYES AGNEW, M. D.

BY THOMAS BRIAN GUNNING, D. D. S., NEW YORK.

34 East 21st Street,
New York, November 26, 1883.

To D. HAYES AGNEW, ESQ., M. D., L. L. D., Professor of Surgery in the Medical Department of the University of Pennsylvania.

Sir: In the preface to your recently completed work, "The Principles and Practice of Surgery," you say: "In the composition of its pages, while I have expressed my own views independently on all subjects, I have also endeavored, as far as was consistent with the scope and limits of the work, to record those of other writers, not only that the student and the practitioner may be made familiar with the literature of their profession, but also that they may be able in their observation and practice to contrast different plans of treatment, and in this way draw their own conclusions in regard to the relative merits of the various modes of managing surgical disease. Whatever may be the defects of the work—and none can be more sensible of these than myself—I have endeavored most conscientiously to furnish a safe and reliable guide for the surgical practitioner."

With this in view, those for whose instruction you wrote could not suspect that the work contains statements which are untrue, and mislead in regard to the treatment of any important injury. Yet the section on "Fractures of the inferior Maxillary Bone" contains such statements. To give a clear understanding of the matter to you, and to all who may read this letter, I quote from your article verbatim and remark upon the misrepresentations. In Vol. I., page 846, you refer to the interdental splints devised by me and used in treating fractures of the maxilla, as follows:

"Among the simplest of Gunning's splints are the forms shown in Figs. 642 and 643, which receive all the teeth of the lower jaw,

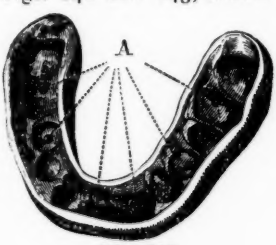

Fig. 642.

Gunning's Interdental Splint. A points to perforations for injecting water.

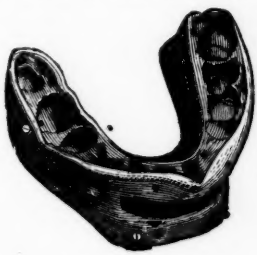

Fig. 643.

Gunning's Interdental Splint.

extend a short distance over the gum, and have perforations through which to throw a stream of liquid for the purpose of cleanliness. This splint when placed in position forms a cap, and is kept in place by securing the jaws together with a bandage, or by means of screws passed between the teeth."

Now my splint No. 1 (your figure 642), was expressly devised to be used without a bandage; it holds the fragments of the jaw in place by means of the teeth without anything external to the mouth, and it allows the jaw to move and to be used in eating and speaking; and this form of splint is adapted to the large proportion of fractures of the maxilla. If the patient can be depended on, never, however, if a child, this splint may in many cases only be fitted to the teeth, and without screws in or between the teeth, or any ligatures, the fragments of the jaw will be held firmly together. For in eating or in closing the splint against the upper teeth the muscles carry the broken jaw up and keep the fragments in place, the muscles and the surrounding soft parts forming a counter support to the interdental splints.

This splint, No. 1, was first applied on February 12, 1861. It was used on the jaw of a Spanish seaman in the naval hospital, New York, and it cured the patient, although he had been subjected to four months' unsuccessful effort of the government surgeons, assisted by others in the vicinity. Thus the surgeons were spared the mortification of sending the man home uncured. A similar splint was shown to the New York Academy of Medicine, January 7, 1863, with another case in which it was used, then published with illustrations in their Bulletin, and in February brought before the Medical Society of the State of New York, as shown in the Transactions for 1863; and in the Medical Report of the Centennial Commission, 1876, this splint was admitted to be the first splint ever used without an appliance outside of the mouth. Surely this splint should have been fairly reported and truly described in your work on "The Principles and Practice of Surgery." Had this been done, other sufferers could have the use of it; whereas, your book misleads the surgeon and student in regard to it.

Even in the few injuries where the fractures are such that it is necessary to use the upper teeth as a base to hold the broken lower jaw still, as in fractures in the ascending rami, or say all fractures back of the teeth, my splint No. 2, just now shown, is not kept in place, as you say, by securing the jaws together with a bandage. This splint,

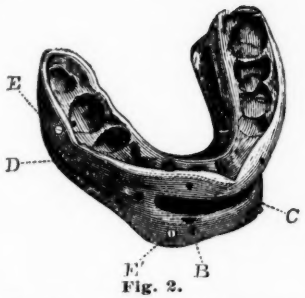

Fig. 2.

B, triangular opening, of which one side corresponds to the cutting edge of the lateral incisor, which tooth stood in the end of the fragment most displaced before the splint was applied. C, opening for food, speech, &c. D, channel for the saliva from parotid gland to enter the mouth, its fellow being seen on the other side of the splint. E, screw opposite lower canine tooth, head of the left screw being just discernable. F, head of screw opposite upper first molar tooth, end of its fellow being seen on the other side.*

like No. 1, holds the fragments of the jaw by means of the teeth only, without any bandage; and while the patients wear this splint they may follow, as with No. 1, their usual occupations.

Of my splint, No. 3, you say: "A third splint of Dr. Gunning's, one which he uses in cases where the teeth have been lost, is formed by connecting steel branches with the interdental part of the apparatus, of which the upper branch passes along the superior part of the face, and the lower one along the outside of the lower jaw; these are kept in place by three bands, one being placed at the chin in order to hold the jaw up in the splint, one running from the metal band to the back of the neck, and one passing to a cap which is worn over the head, and with which the splint is connected."

Gunning's Interdental Splint.

Fig. 644.

This is my plate 3, with its reference letters cut away, and your description leads the reader to suppose that a band of *metal* goes under the chin to hold the jaw up in the splint, and that metal bands are used instead of strings of tape to hold the splint by means of the cap and to keep a metal band from slipping over the chin. But no metal band is used anywhere nor spoken of by me. In the absence of teeth, the wings are used, two on each side, the upper range over the malar bones and the lower along the jaw; and from the cap on the head, tape strings pass down on each side

*This figure 2 was left out in the letter sent to Professor Agnew, but it is here shown in order that the reader may compare it with Dr. Agnew's figure 643, which is the same cut with the letters erased.

to the upper wings and hold the splint against the upper gum, while the broken lower jaw is held up in the splint by a single thickness of linen or other thin material, which extends across under the chin from one lower wing to the other, while the lips, cheeks and all the face are left free from pressure.

This statement would place the splint plainly before your readers, and give them the use of it, for their patients, when they needed or preferred it. This description is also briefer than your deceptive text. Certainly this splint, No. 3 (your figure, 644), deserves fair notice, it having been successfully used on the bad fractures of the Hon. Wm. H. Seward subsequent to the attempt to assassinate him.

Surgeon General Barnes and Surgeon Basil Norris, of the army, together with Dr. Whelan, chief of the medical bureau of the navy, and others, had signally failed to secure by ligatures and bandages the fractures received in falling from his carriage, before the Secretary was cut so terribly on the night that President Lincoln was killed.

Further, I did not take charge of the case nor set the fractures until twenty-five days after the accident, fifteen after the attempt to kill him; yet this splint with upper wings held the double and compound fractures of the jaw securely for sixty-eight days without a moment's intermission.

I described this splint, No. 3, to the New York Academy of Medicine, June 1, 1864, but the upper wings were never used until I applied them, May 2, 1865, in Mr. Seward's case.

Since then a severe fracture without a tooth in the mouth has been successfully treated, in which both upper and also the lower wings were used. It was applied in May, 1879, to the jaw of a farmer, seventy years old, with such good result, by Dr. Adams Bishop, reported in *Johnston's Dental Miscellany*, Vol. VII., page 63, and in the *Independent Practitioner*, Vol. II., page 108. Thus the splint, No. 3, has been fully tested, for this patient's fracture could not be held by the bandages used by the physicians who first attended the case. I devised this splint for fractures without teeth to hold by, and it has proved to be a perfect control for such cases; for the Secretary of State attended to the duties of his office while wearing it, and the farmer walked around at once, and followed his plough and did heavy work before his splint was left off, although he wore it only six weeks.

The deception of your text in regard to my treatment of these injuries is made complete by leaving out my splint, No. 4, here shown.

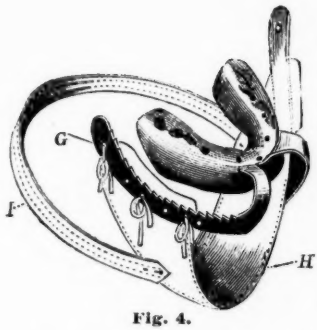

Fig. 4.

This splint, made of tin, and applied to the teeth of the fractured jaw by means of a lining of gutta-percha, or of plaster of Paris, was devised in 1863 for hospital use and for practitioners out of the reach of a dentist. It is cast with a handle in front, so that it is an impression cup such as dentists use, but when applied as a splint, the handle is cut off, and, if needed, wings are soldered on, and from these, when the splint is worn, a single thickness of roller passes under the jaw from one wing to the other.

I reported this splint to the New York Academy of Medicine, June 1, 1864, in answer to their request and letter of thanks in 1863. Within the week after reading the paper, I applied this splint, No. 4, to the jaw of a boy under Dr. Freeman's treatment, and in July I used the *same* splint with a new lining on the jaw of a boy sent to me by Dr. King. The indentations shown in the cut represent those made by the upper teeth of both boys when eating.

These splints, Nos. 1, 2, 3, 4, with cases to explain and illustrate the treatment, are clearly shown in my paper on the Treatment of Fractures of the Lower Jaw by Interdental Splints, first published in full in the *New York Medical Journal*, in 1866; they are also distinctly and fairly shown in every edition of that unique work, Injuries and Diseases of the Jaws, by Christopher Heath, F. R. C. S., published by John Churchill & Son, London, and by Lindsay & Blakiston, Philadelphia. (This work is the Jacksonian Prize Essay of the Royal College of Surgeons of England for 1867.)

The splints are also described at length and favorably noticed in the Report of the Judges of Group XXIV. on Medicine, Surgery, and Prothesis, transmitted by the Secretary, J. H. Thomson, A. M., M. D., to Prof. Francis A. Walker, Chief of the Bureau of Awards, and edited by him for the U. S. Centennial Commission, and issued by your own Publishers, J. B. Lippincott & Co., Philadelphia, before your work, "The Principles and Practice of Surgery." In all these publications the splints are explained and illustrated by the same plates used in your articles upon "Fractures of the Lower Maxilla." But your book shows my plates with the reference letters cut away,

except to the holes for syringing, and states that the splints are held in place by securing the jaws together with a bandage. Whereas, my interdental splints were expressly devised to obviate the use of these bandages, which are cumbersome, unreliable and often destructive. These splints are not, as you intimate, merely supplemental; each one is a complete and reliable support.

The first is for all injuries in which the fractured jaw is allowed in my methods to move naturally while under treatment, and by far the larger proportion of fractures can be thus treated.

The second splint is for fractures in which the broken jaw is held in fixed relation to the upper one; and in some of these cases this splint does not cover the front teeth, so that, when worn, it is unseen.

All the splints have small openings to allow observation of the teeth which are near the fractures, so that the position of the broken ends of the bone can be learned at any time without removing the splint; and in fractures in which the lower jaw is held in fixed relation to the upper one, the splint has channels for the saliva from the parotid glands to pass in around the tongue.

You leave these important devices unnoticed, and cut away the letters of reference, yet, in the text given (say seven lines) to my splints, 1 and 2, you twice remark upon keeping the splint clean, and twice say or suggest that they cover all the teeth of the lower jaw, and then leave your readers ignorant and misled in respect to the radical features of the splints. But, in less than the room given to the repetition, you could have told that these splints hold the fragments of the bone in place securely, without anything outside the mouth; are quite comfortable, and the patients attend to their business and move about as when their jaws are sound. They do this even when the fractures are so severe that the jaw is held in fixed relation to the upper teeth, for in such cases the opening in front affords room through which to speak and receive food. But in most fractures, as before stated, the jaw is allowed to move, and the top of the splint is used in eating.

The eight cases in my paper which show the complete control attained by means of these splints were carefully selected; and with the four cuts spoken of in this letter, place my treatment, shown fully in 1866, at the service of all. Mr. Christopher Heath quotes from the *New York Medical Journal* and the *British Journal of Dental Science*, 1866, and his book shows my treatment clearly. In its appendix, case six, is my report verbatim of the Hon. Wm. H. Seward's case.

The official report of the United States Centennial Commission closes, in respect to my treatment of fractures of the maxillæ, as follows:

"In connection with the splints shown, was a series of casts illustrating the double-compound fracture of the jaw of the late Hon. William H. Seward, showing the jaw broken on both sides between the bicuspid teeth. Also a double cast of the upper and lower jaw as held by the splint for sixty-eight days. As no teeth were left in the upper jaw, the wings and cap were used, as shown in Fig. 3. The result was thoroughly satisfactory."

The Secretary, Dr. J. Henry Thompson, who transmitted this report of the Judges of Group XXIV., was a resident of Washington, where I treated the Secretary of State.

In addition to all this, your own city, Philadelphia, has in one of its prominent men a proof of the superiority of my treatment by splint over that by bandage, as used by Professor Buckingham of the Medical School of Harvard University. The fracture was received in the terrible stage accident in the White Mountains, in 1873, and the jaw, when the patient was brought to me, was so deformed that I had to break it apart. The splint was shown in the Centennial Exhibition of 1876, and the case is fully reported in the *Independent Practitioner*, Vol. I., page 526.

I have said that you leave out my splint 4; but, worse still, you place next after my Fig. 3 a splint which you show as Kingsley's, preceded by a description which ends as follows: "When applied, the teeth occupy the cavities in the splint, the latter being kept in position by a strip of roller passing beneath the chin from one arm of the apparatus to the other."

Now this method, the splint and the wings (arms) were devised by me. The splint, with its wings, was shown on the patient to the New York Academy of Medicine, October 21, 1863. It was for showing this apparatus that the Academy passed the resolution thanking me, and requesting me to report further; and, in response to which, I read the paper, June 1, 1864, which explained my four splints. See Bulletin, Vol. II., pages 153, 168, 307.

Kingsley does not use the splint nor the roller, as you say, but applies a sub-mental splint or compress, which is by means of some apparatus or band kept in connection with the interdental splint, the broken jaw being between them, and he maintains that this is necessary. But for fracture at the angle of the jaw, or in the parts

above, he says that an interdental splint is useless, and that a bandage is indicated; that is, a bandage around the jaw and head. Thus Kingsley uses appliances external to the mouth in all cases, although my interdental splint, which, by enclosing all the lower back teeth, holds in the angles of the jaw has been in use since February 12, 1861, his treatment of fractures of the jaw is no improvement upon that of twenty-five years ago. In fact, he advises for fracture in front of the jaw, that which is inferior to Hayward's plan of 1858, in which a metal cap was fitted to several teeth on each side of the fracture, and from the upper surface of the cap a stout wire went out of each corner of the mouth to a gutta-percha splint under the chin, and from beneath this a four-tailed bandage passed behind and over the head; thus the lower tails passed outside the angles, which could therefore be held in with pads. Whereas, Kingsley says: "If the fracture is in front, the splint need not cover all the back teeth; but if it be at the side, it is better to cover all the teeth of that side. It is also better to set the ends of the upper and lower jaws in an articulator, and thus make prints of the upper teeth in the wax, to be retained in the splint." But with the splint so cut off as not to enclose the back teeth, the angles will be forced out by the muscular traction on the inside of the chin, for the outside wings cannot be used beyond the ends of the splint, as they would lift it up from the front teeth. In fact, the muscular traction on the inside of the chin might alone wring the fractured ends out of the splint by forcing the latter up the outer surfaces of the canine or bicuspid teeth. Again, if the splint only covered the teeth on the fractured side, then those of the other would have no bearing, and no eating could be done except on the splint over the fracture; and if the patient should happen to use the uncovered teeth on a large morsel, it might force the fractured ends apart, whether they were in the side or in the front of the jaw. Dr. Kingsley's examples of the application of this splint to double or triple fractures are quite as bad as his advice in regard to single fractures. All he shows of importance, was first devised, used and published by others before him; it is, as told by him, of little service to the reader, because of its intermixture with statements which are not in accord with the facts of history nor of science.

Yet your text is such as leads the reader to adopt his treatment and reject my methods—this, not because of any want of clearness in my description, for you could have quoted from my paper in the *New York Medical Journal*, Vol. III., page 434: "When a well-adapted

splint is on the teeth and gum, the other parts around the bone are, to a great extent, a counter-support to the splint . . . . Meanwhile, the motions of the jaw are in most cases unrestricted, and the cheeks and lips always left free." Ibid, 442, "Fig. 1, is the representative splint for treatment of cases in the first class or those in which the jaw is left free. Fig. 2, for the second class, or those in which the jaw is held still."

Yet, with this plainly stated, you class these splints together, and say: "This splint, when placed in position, forms a cap, and is kept in place by securing the jaws together with a bandage, or by means of screws passed between the teeth." Your text, on page 847, confirms this, as follows: "The splint of Dr. Bean resembles closely that of Dr. Gunning." . . . "The splint, when applied, is kept in position by straps which pass over and around the head, and also behind the neck." Your text again misleads the student, for you admit that Bean's splint "is fitted to the teeth of both the upper and lower maxilla," in which cases my splint is screwed to the teeth, and while I use nothing outside the mouth, you lead the reader to suppose that I use a bandage around the jaw and head, and you do this, although my treatment of fractures, with the splint illustrated by Fig. 2 (your Fig. 643) is related in the *New York Medical Journal*, Vol. IV., page 16. In case five it is distinctly shown that the surgeon in Bellevue hospital who had charge of the woman, tried to hold the jaw up in the splint with Hamilton's bandage, but on the third day he requested me to screw the splint fast to the teeth, as the bandage was painful and useless. The splint was screwed to the teeth, and the jaw united in forty days.

In January, 1861, Dr. Benjamin Franklin Bache, U. S. Navy, advised that I should be asked to treat a Spanish seaman, whose fractured jaw was found to be incurable at the Naval hospital, N. Y. Howard Hayward's method of treating these injuries was then the most advanced, and although it was very imperfect, did much to prepare the minds of surgeons to accept the co-operation of dentists, at least in Great Britain. After study of the literature of the subject, say as given for twenty-three centuries back, and then making careful allowance for the muscular action involved, I devised the splints and methods of applying them, which were fully published; and the correct action of the muscles which control the jaw was shown to guide the surgeon. This was necessary, as I demonstrated that the *external pterygoid* muscles depressed the jaw and opened the mouth,

instead of the *digastrics*, as maintained by Hunter. I also explained that the lower jaw is the lever by which the head is held forward, so that, when the jaw is broken, it requires firmer control than can be given by appliances which rest upon the soft parts external to the mouth. In the years which have since passed, my experience has suggested nothing which I think necessary to perfect my treatment of fractures of the maxillæ.

You however do not show my splints and methods *fairly*, in order that your readers may contrast my plans with others, and judge of their relative merits, as the student is led to believe by your preface.

I trust that you have been yourself imposed upon, and that you will now and in the future, as far as possible, correct the wrong which has at present the sanction of your name. I am, Sir,

Yours respectfully,

THOS. BRIAN GUNNING.

Philadelphia, 1611 Chestnut Street,
December 1, 1883.

DR. THOMAS BRIAN GUNNING.

Dear Dr.: I am indebted to you for an accurate description of your interdental splints for fracture of the jaw, and shall with great pleasure make the correction in the next edition of my book, should it reach a second edition.

Very truly yours, etc.,

D. HAYES AGNEW.

WHAT VULCANIZED RUBBER DOES.

BY L. P. HASKELL, CHICAGO, ILL.

In the March number the "old story" comes up again, but I notice your correspondent is not on the right track.

Now while there is "mercurial poisoning" from vulcanite plates, which I can demonstrate beyond all peradventure, that is comparatively rare; but the main evil arises from their *non-conductibility*, so that the retention of the heat under the plate constantly inflames the membrane, and not only produces a very uncomfortable feeling in many mouths, but produces most serious results in the undue absorption of the alveolar process, to such an extent that thousands of mouths are ruined for plates, there being nothing left but a flexible ridge of thickened membrane.

If the suction is poor, or the plate is being constantly loosened by a faulty articulation, so that the air circulates under it to some extent, the effect is not so rapid.

Six years ago I visited Boston, where I previously practiced, spending two months, and took occasion to examine the mouths of quite a number of my former patients, whom I had not seen for more than twenty years, and who were wearing plates of gold or platina made by me twenty to twenty-four years previous, and in every instance their gums were in perfect condition, hard and healthy, showing no signs of undue absorption, lower as well as upper.

I was surprised, for all these years, since the introduction of rubber, I had so constantly witnessed its bad effect, in the shape of inflamed, spongy, unduly absorbed gums, I had come to regard it an every-day affair, although in my present practice the mouths wearing metal plates are constantly bearing the same testimony as in the Boston cases. Nearly forty years' exclusive practice in mechanical dentistry has given me abundant opportunity to establish the truth of this theory, which was first brought to the attention of the profession by Dr. W. B. Roberts, of New York, more than twenty years ago, in an article written for the "*People's Dental Journal*," published by myself, in which he uses the following language:

"These effects, as noted in our own experience, and declared by the evidence of many others, were, first, *a great absorption of the alveolar and bony substance of the jaw;* next, irritation of the mucous membrane, and a *condition nearly approaching salivation;* then gastric irritation, and finally, the general derangement of the health consequent upon such abnormal conditions.

All these symptoms of disease were removed by simply removing their obvious cause, RED VULCANITE; while a healthy condition continued after replacing it with gold, or continuous gums.

One cause of these inflammatory conditions under red, or any color of vulcanite, is the fact that it is a non-conductor of heat, and this cause, as will be apparent to any physiologist, is sufficient to produce the worst results."

I would add, further, that the same results follow the use of celluloid. Such being the facts, what is the duty of the dentist to his patient when being consulted as to what is the best material for plates? To let him remain ignorant of these things, and suffer the results as thousands are doing, or to advise the use of a metal plate? To be sure, there are many who can afford nothing but the rubber, but give all a chance to choose.

WHICH WAS FIRST, THE HEN OR THE EGG? THE "BUG" OR THE ACID?

BY F. Y. CLARK, M. D., D. D. S., 35 W. 35TH STREET, NEW YORK.

Which was first, the hen or the egg? is still a mooted question; and so we may now say of the "bug" and the acid; for it would seem, from Dr. Miller's last modification of views, that investigation as to the real cause of dental caries has culminated in this one question.

Over twenty years ago we became quite satisfied that caries was not caused by fluids of the mouth, but by septic factors generated in pits, fissures and all inaccessible places where particles of food can lodge and remain unmolested. After long years of investigation, contradiction, and no little abuse, it affords us considerable pleasure to—without the fear of contradictory proof—repeat what we have written and asserted in various papers and on various occasions: *That carious tooth structure is brought about by organic factors, inaugurated by air germs through fermentation. That in all pits, fissures, abraded, defective, hidden, and all inaccessible places in and about the teeth where particles of food or foreign matter are lodged, and remains unmolested, fermentation sets in and organism follows organism, absorbing the bioplasm in the canaliculi, leaving the limey substance to disintegrate. The change of shade is caused by the pigment in the protoplasm of bacteria which is light yellow, brown or dark, according to organic advancement.*

By carefully looking over Dr. Miller's last paper, and comparing it with his preceding papers, we find his investigations lead to the same view, with the exception that he contends that the *fungi* produce—or through fermentation manufacture—an acid which they send ahead to break down the mesh walls of the dentine and thus prepare the way for their entrance.

In a former paper, he says: "Enormous masses of fungi, leptothrix threads, bacilli, micrococci, etc., work their way into the deeper parts of the softened dentine, stop up the dentinal tubuli, or destroy the dentinal fibrils. The outer layers of dentine consequently receive no further nourishment, lose all vitality and fall a prey to *putrefaction*." In another place of the same paper, he adds: "The masses of micrococci and bacilli which penetrate the dentine, stop up the tubules and must lead, sooner or later to the death and destruction of the dentinal fibrils, in consequence of which the outer layers of the dentine lose their nutritive connection with the pulp and die from lack of nourishment."

Now it seems to us rather strange that Dr. Miller, so apparently particular in many other respects, should so unwittingly lose sight of one of the most important of all functions pertaining to these organisms. He is most certainly aware that they exist at the expense of the substance in which they are found; and as they cannot subsist on, or absorb, the lime-salts, and are, as he says, away on beyond the zone of decay, by what means, then, do they subsist and increase? As we have said before, they absorb the bioplasm in the tubules and through this nourishment exist and increase; for, according to Pasteur and all high authority, "*fermentation is a change of chemical composition in organic compounds brought about by a certain class of plants or organisms which, deprived of drawing the essential element of their composition from the air, propagate themselves in the very substance of organic matter of all kinds by the breaking up of these matters and appropriating such elements as are necessary to their own growth.*" If Dr. Miller's theory as to the action of *fungi* on the teeth is correct, it must hold good in other parts of the system. We would have to say bacillus anthracis of splenic fever destroys vital tissue by an acid instead of choking up and converting life-plasm into their own species. And so of micrococcus vaccinialis—small-pox bacterium—micrococcus diphthericus—diphtheric bacterium—micrococcus septicus—pyæmic bacterium—of Koch's bacillus tuberculosis and so on through the whole list of germ contagion. This would upset the investigations of Pasteur, Cohn, Koch, and all other co-workers in microscopic science. According to their writings, and the experiments of Buehl, Hunter and Ortel, made by some as early as 1871, bacteria of the micrococci and bacilli species destroy all tissues and muscular fibers around which they intwine and propagate by appropriating the life substance of such tissues and fibers for the rapid propagation of their own species, and by this rapid increase fill the capillaries, arrest circulation and produce death. Evidence in support of this view has accumulated and become indisputable. To accept the theory of Dr. Miller we must decide this to be all wrong; for what holds good in the life history and behavior of any one species of these organisms in one instance, under similar conditions, holds good in another.

"The outer layers of dentine lose their nutritive connection with the pulp, die from lack of nourishment and fall a prey to putrefaction."

How about pulpless teeth with filled roots? Do they fall a prey to putrefaction? Their nutritive connection with the pulp is severed, yet they do good service and last indefinitely.

We are not willing to say these organisms enter sound enamel directly. What we wish to convey is: *that they make their entry from abraded or defective parts,* and it is even reasonable to suppose that through fermentation, in many protected localities, they may produce an acid sufficient to dissolve enough lime-salts from the enamel to open the way; but to assert that they, when strung along in chain-like rows in the canaliculi of the dentine, destroy and decompose this tissue by an acid, is contrary to fact and evidence. But even admitting this—the mooted question—we of the germ theory are still right, for the *germs are first* and the acid second. *Without the germs,* there would be no *acid;* and without the acid, *no caries.*

In order to detect the supposed acid beyond the zone of decay we, with others, have, from time to time, within the last year, made over fifty microscopical examinations of such dentine, taken from teeth in the mouth, and have failed in every instance to detect anything like an acid. A careful and patient microscopical study of acids under two or three powers, ranging from a one-fourth to a Toles' one-sixth, or a Spencer's one-tenth, with B or C oculars and good light, will soon enable one to detect the minutest trace of acid in the saliva or dentine. We know from our own investigation that this is a surer and much more reliable way than litmus paper, for, in many cases, we have detected acids in this way when litmus paper failed to reveal them.

In the August number, 1883, page 232 of this journal, Dr. Miller says: "As a summing up of what has been said, I will state that from careful study of over one hundred and fifty preparations, I am driven to the conclusion that there is as yet no sufficient ground for the assumption that micro-organisms play any more than an *unimportant* part in the caries of enamel." *How can this be if, as now admitted, the bacteria, through fermentation, produce the acid?* If the acid is produced by fermentation, through the activity—or by means of—bacteria, how then does the bacteria *play a subordinate part?* The so-called "*fungi**" in the first stages, he says, "is not observable." Why? Because, in all incipient stages, before these organisms enter the enamel, they are frequently washed away and have to make many successive attacks, involving months and frequently years, before they

*We don't believe this word is strictly applicable to the micro-organisms under consideration. Cohn, who has given us the most acceptable classification, says: "There is no relation between bacteria and mold fungi. When I commenced these observations, I made it a main object to find out whether bacteria come from germs *sui generis* or are developed from other fungi. The results are in refutation of the latter view. I have made hundreds of observations, and they show me that bacteria will only bring bacteria, and mold fungi only mold fungi."

secure an unmolested lodging. Therefore, the enamel may be abraded *without the true factors being observable.* Again, we must bear in mind the low organic nature of the enamel as compared with the dentine. There is *little or no nourishment* there to invite the stay of these organisms, therefore they pass on into the tubules of the dentine in search of richer food and, as Dr. M. says, "*are not observable.*"

As stated, it is quite common to see the dentine powdered, or so that it can be removed in layers, leaving the enamel entirely intact, excepting the aperture of entry. How is this? Has the acid greater affinity for the *dentine* than for the *enamel?* When we compare the analysis of the two, *we see the reverse is the case;* and yet the *factor seeks the dentine and not the enamel.* Again, the lime-salts of the dentine are not dissolved, but disintegrated, and can, by careful manipulation, as Dr. M. states, be found in a powdered condition, which is accounted for by the mesh-work or bond of union being *removed or absorbed* by micro-organisms. If the dentine was dissolved by acids, it seems to us it would not be seen in *powder or layers;* nothing but the organic tissue would be left.

In speaking of advanced caries of dentine, Dr. M. says: "The outer layers deprived of nourishment die and fall a prey to *putrefactive agents,*" but in all his papers he has been *singularly reticent* as to what these agents are. How can organic putrefaction take place without *bacteria termo?* And yet we understand him to say that this organism is not found in carious dentine. Then, according to Pasteur, Cohn and my own observations, putrefaction of carious dentine *can never take place.* We do not claim that our knowledge of bacteria and microscopy, or that our facilities for investigation are as good as Dr. M.'s, but if he ever comes to America we will take pleasure in showing him bacteria termo (according to the plates of Cohn) in carious dentine.

Considerable importance, judging from the last of the sentence, is put on the following quotation from Dr. Miller's Springfield paper: "A question in practice is suggested by the following case. A patient comes with a tooth containing a large amalgam or gold filling, made five or ten years ago. The filling was inserted over a living pulp, which afterward died; or, as frequently happens in Germany, over a dead pulp. An abscess followed and a fistula was formed which has been active at intervals throughout the whole period of ten or more years. During all this time there was probably not a moment when a microscopic examination of the contents of the root canals would not

have revealed great numbers of fungi under conditions of moisture and temperature very favorable to their development. When, therefore, we remove the filling and find no signs of caries in the root, we wonder what those organisms have been doing all these years."

This is rather an isolated and exaggerated case. But it proves as much one way as the other—perhaps a *little more for the germs* than for the acid. If an amalgam filling, the *mercury* in the amalgam acted as an *antiseptic* and the crown was kept comparatively free of *septic action*. But in reality, after the death of the pulp and all the nutriment in the mesh tubes of the dentine was absorbed or exhausted, there was *nothing more in the tooth to sustain life*. They could not subsist on the *lime-salts*, therefore they drew their supply of nourishishment from above or below through the foramen. In such cases the framework of the tooth remains indefinitely, according to *many conditions*. But what, let us ask, becomes of the *acid* produced by the "*great numbers of fungi*," that are said to be in the root-canals of such teeth? for, according to Dr. Miller's theory, there ought to be an *immense factory* of acids in all such cases. If *one little micrococcus can manufacture sufficient acid to open up his way through sound dentine, is it not reasonable to argue that large numbers can manufacture enough within ten years to decompose the dentine in one dead tooth?* Yes, if, as asserted, *one little micrococcus or bacillus can* PRODUCE ACID *enough to cut his way through sound tooth structure*, then it must follow, as the "night the day," *large numbers*, as in the case quoted, *ought to produce acid enough, according to the same theory, to decompose or dissolve the dentine in the canals of one dead tooth inside of five or ten years*. If they cannot, then, in Dr. M.'s language, we say, "*evidently there is a limit*," *and we may say with confidence, acids thus produced are not sufficient to destroy dead teeth.*

But, seriously, were it not for encumbering this paper, we could cite many similar cases occurring in every-day practice, proving, almost beyond contradiction, that bacteria play the *most important part* in the decay of the teeth. If, as Dr. M. says in his last paper, they belong to an organic ferment, *which we have always claimed*, and this ferment produces an acid which acts on the teeth, then, as said before, the germs are *most important and first; without them, there would be no acid; and no acid, no caries.*

Dr. Miller says in his last paper, found in the March number of this journal, that: "Exp. 1. Fresh saliva is mixed with sugar or starch, one to forty, and kept at blood temperature. It invariably

becomes acid in four to five hours. But *some one*, no doubt, will say this is a result of *no consequence*, because the experiment was not made within the oral cavity. For his personal benefit we give the following."

As to the first sentence of this experiment, we would say that any one at all familiar with the first laws of fermentation must know that the same thing will occur under all and similar circumstances with any and all liquids containing nourishment for organic life. But does this occur with the saliva within the oral cavity? Yes, if the *supply from the ducts is stopped*, that which is left will turn sour, but not enough to *corrode the enamel*. This, however, never takes place in the mouth. There is a constant flow of neutral saliva from the ducts, consequently no time for such fermentation; therefore, we agree with Dr. M. in his assertion that "*some one will say this is of no consequence*," for we can honestly say it is not of the *least* consequence.

Exp. 2. A glass tube, two c. m. long and three m. m. wide, is filled with starch, *sterilized*, and fastened to a molar tooth in the mouth on going to bed; next morning the contents of the tube will have a strong acid reaction," etc. We are at a loss to understand this—"A glass tube filled with starch, *sterilized*." Is not this an error? Should it not include saliva? But even so, how could fermentation and strong acid reaction set in if *sterilized?* By sterilization *all organic ferment* will be destroyed and, consequently, no change should have occurred. Any liquid, *sterilized*, and closed hermetically, free of air germs, should remain so indefinitely, as is proven by

"Exp. 3. The mixture of saliva with starch or sugar is kept for a half-hour in the *sterilizer* at one hundred degrees centigrade, and then placed in the incubator; it does not become sour in four nor in twenty-four hours; in fact, *not at all*."

"Exp. 4. The starch is heated to one hundred and fifty degrees centigrade before mixing with the saliva; the solution still becomes sour," etc. Now, how is this? If the starch was *sterilized* as stated in Exp. 2, and becomes sour in the mouth, why did it not also become sour in Exp. 4? Both, as stated, were *sterilized*, and one *became sour and the other not*. We know of no two degrees of sterilization.

If normal saliva is sufficiently acid to account for incipient caries, then this acidity must be brought about through fermentation in the oral cavity, or before the saliva leaves the glands. In abnormal conditions we know this is so; but in health the saliva is nearly always

found neutral or slightly alkaline. How, then, do we find teeth subjected to the last condition affected with caries? It will not do to say, because the saliva can be fermented, as in Exps. 1 and 2, that it can dissolve tooth structure; for such conditions are never found in mouths excepting in carious teeth and unmolested localities, where fermentation is unmolested. We admit that in abnormal conditions of the system the saliva is nearly always strongly acid or alkaline, especially in all diseases of the stomach and bowels, and where there is inflammation of the alimentary canal; but in health, and commonly where caries is making rapid progress, as said before, it is neutral, or sufficiently near, to preclude the possibility of action on the enamel. The saliva in health and out of health is so different, and subject to such changes or variations, that it would be very unfair to say that because it can be fermented and made sour or acid, this is the natural condition. This, according to dental chemistry, and our own observation, is generally the extreme abnormal condition. If we want acid, alkaline, milky, bloody, fetid, saline, and many other varieties, they can all be collected from the mouth in certain diseased conditions of the system.

As to color-blindness we are informed by reliable optical authority that those who are most positive as to their correctness of color vision are generally the ones most afflicted. But this is not the worst blindness poor humanity is heir to. Early teaching, professional prejudice, eclat, favor and reward, etc., too often blind our eyes and prevent honest investigation; for, disguise it as we may, these *scales*, like the cork on a fish-line, bob up and down at the least ripple of favor or reward, and thus our eyes are blinded and minds perverted. To be true and honest investigators, we must first free ourselves as far as possible of early predilection and of all and everything calculated to bias honest work, and, like conscientious jurors, have our verdict according to fact and evidence.

In conclusion, we think it safe to say that bacterial factors play the *most important role* in the production of caries; this is fully proven by *antiseptic treatment*. No mite of animal or vegetable matter in or about the teeth can undergo fermentation so as to introduce organic action sufficient to act on the enamel within eight or ten hours; therefore, if every attempt at fermentation within the mouth is broken up by carbolic acid or some similar antiseptic wash within the time stated, it must follow that no fermentation can take place and the end is *no fermentation, no "bugs,"—no "bugs," no acid.*

We once knew a little bad boy who was in the habit of teasing a faithful neighboring watch dog by poking him with a long stick. The dog would growl and bite the end of the stick, which was fun to the boy. But one day the dog reasoned the thing over and went for the *boy;* the boy went for home with defective pants and the dog was poked no more. Now if the "bugs," as Dr. M. says, poke their acid up the tubules we had better go for the "bugs" as the dog did for the boy. Going for the acid like going for the stick has been tried, and is nothing but fun to the "bugs." As the "bugs" produce and use the acid, they are the head devils in the fight. Therefore, if we use reason and go for them with proper antiseptics we may not get their pants or "catch" them, as Dr. Watt says Dr. Miller has, by the "tail," but, better still, by heroic action annihilate the whole tribe.

EDITORIAL.

PROF. GORGAS' DENTAL MEDICINE.

The *Dental Cosmos* of March, 1884, contains a notice by "A. W. H." of Prof. Gorgas' late work, "Dental medicine," not in harmony with the high commendations it has received from other dental journals both in this country and in Europe. Its object seems to be "To damn with faint praise," or rather with alternate approval and criticism, so that the latter shall neutralize the former.

The article says: "The work contains a large amount of useful information which is not to be found in any other one volume, but we think a different disposition of the material could have been made, which would have made it more convenient for reference."

The critic is down upon the chapter, "Important Points in Diagnosing Affections of the Mouth" in this wise: "This is wanting in accuracy and incomplete in detail—as, for instance, the portions which refer to inflammation of the dental periosteum and alveolar abscess." Why did he not *show* the inaccuracy, and not merely assert it? Of the description of pyorrhea alveolaris, where Dr. Gorgas says there is "a recession of gums and absorption of alveolar process, a tendency to hemorrhage," etc., the critic says: "The facts are quite generally the contrary." Then, as if conscious that he had rendered himself liable to the charge, says: "These comments are

made not in a hyper-critical spirit, but in the interests of scientific accuracy."

Scientific accuracy, indeed! that pyorrhea alveolaris is not characterized by "recession of gums and absorption of alveolar processes, a tendency to hemorrhage," etc. Can it be that "A. W. H." has ever seen pyorrhea alveolaris in all its stages?

But, again, he says: "We think the author, in the endeavor to present a large amount of matter in limited space, has sacrificed clearness of description and accuracy of detail," and then complains that no mention is made of twenty or more agents whose merits as dental medicines are yet in doubt. Other criticisms are so indefinite that they admit of no answer—such as "We hope that in future editions the author will omit much of the extraneous matter with which the book is encumbered," etc.

On first reading the article, we thought it an attempt at scientific "buncombe" rather than candid criticism. As a whole, the criticisms are either frivolous or incorrect, and nearly all of them seem hyper-critical and unkind in spirit.

The work will survive.

CARBOLIC ACID IN THE TREATMENT OF DIPHTHERIA.

Dr. Götz recommends as a safe treatment of diphtheria the injection of carbolic acid into the affected glands and the parenchyma around them. He observed that the diphtheretic membrane easily died after a short time, and even if it should creep from the glands into the soft palate, it is rarely very intense. It is as if the poison had been deprived of its active vitality. The injection into the tonsils he used in quite a number of cases. Of sixty-four cases, he treated half with injections and half without. Of those treated with injections, not one died; while of the others, 11 per cent. died. Though the whole number of cases thus treated is not yet very large, it would be worth giving the remedy a good trial in this scourge; the treatment appears very rational and easy.

FAT AS AN ANTI-FAT.

Dr. Demuth, of Germany, has made extensive experiment in reducing fatness with a treatment of fat, and he comes to the conclusion that fat is not such a bad drug for great fatness.

We have several letters from a prominent gentleman in the profession who is interested in the question—now uppermost in the minds of the best informed dentists—of antiseptics, and they so clearly state the real issue involved that we venture to quote a portion of them.

"I am glad you are keeping the antiseptic question going. It may result in getting something that is effectual and that dentists can use. For a dentist's use an antiseptic must be a 'dead shot.' Nothing that simply arrests, retards or anæsthetizes the 'bug' is of the least use. It is a deception and a snare, deceiving the patient into the idea that he is having something done, and the operator that he is doing something. The bichloride of mercury seems so far to come the nearest to our aim, though if the fools catch the idea that it is a salt of mercury we shall have another vulcanite and amalgam scare." . . .

"It seems to me that what we want of an antiseptic is not in cavities that we are about to fill—for the very stopping out of moisture and air destroys the germ life—but in the open mouth to arrest decay and to cure 'Riggs' disease' in its incipiency; something that the patient should take with his daily ablutions as a daily safeguard. When caries has begun, it is n't going to do any good for the patient to come to the dentist once in six months, for the disease will continue in spite of any and all such care. The patient must have it in his power to arrest, when begun, and to prevent, when free from, caries. And so with 'Riggs' disease.' If bacteria have a part in this, as no doubt they do, it is only by constant daily applications that they are to be kept away, and, when the dentist has done faithfully his part, prevented from recurring. This must be done by the patient himself; the dentist is helpless."

An October number, 1881, of *Johnston's Dental Miscellany* wanted. Please correspond with the editor of this journal.

Owing to the activity of our contributors, we are obliged to let much editorial matter go over to future numbers.

A dental practice for sale. See advertising pages.

TRANSLATIONS.

SUBSTITUTES FOR LOST JAWS.

BY DR. W. KAY OF BERLIN, PRUSSIA.

[Translated from the Zahntechnische Reform, Jan., 1884.]

Until recently, little has been known about substitutes for lost jaws, which may be easily explained by the rarity of the defect and the difficulty of supplying said appliances. A little more than a year ago, Dr. Dieffenbach, of Bonn, made such a substitute for a driver, but a description of it was not published. I myself had an opportunity to see the photographs of this case; the defect had arisen by the necessitated resection of the entire upper jaw, as far as the sockets of the eyes, in order to remove a fibrous tumor which had formed in the cavities of the nose and mouth. Another case, that of supplying a substitute for a lost lower jaw, has been recently de-described by a Mr. Sauer.

I have had, in the last few years, to furnish artificial substitutes for four cases where one-half of the upper jaw had been removed. There are various causes making resection of the jaws necessary; these I only incidentally enumerate, as they are of secondary importance to the dentist charged with making the artificial substitute. These causes are mainly syphilis, polipi in the nose or mouth, and necrosis. I shall not, therefore, enter into details concerning the origin of these four cases. The removal of the several bones and the cicatrization of the cut soft tissues naturally results in a very considerable disfiguration of the face. The soft tissues fall in; the face is distorted and crooked in consequence of the shortening of the muscles, and as the bone which separates nose, mouth and throat cavity no longer exists—the hole reaching up to the nasal canals—speech is impeded and swallowing made difficult, inasmuch as the food would come out through the nose. Such patients are naturally very wretched without artificial substitutes, and it should be the ambition and aim of every practical dentist to be also able to exercise his art in these special cases for the benefit of his unhappy fellow creatures. The most difficult matter in these cases is the obtaining of an exact impression. The mouth is generally, in consequence of the shortening and cicatrization of the muscles of the face, so contracted, and its opening so small, that *scarcely a teaspoon can be inserted.* But even if we *do* insert an impression cup, a second difficulty will

present itself. In consequence of the great contraction, the lower and upper jaws can be but very slightly separated from each other; and, taking for granted that there are teeth on the non-resected side, it is evident that an ordinary impression cup cannot be inserted, and that a sufficient quantity of impression material cannot be carried in high enough to obtain an exact impression of the cavity caused by the removal of the upper jaw bone. In order to insert the impression material, therefore, it is necessary to leave that side of the cup which would otherwise press against the teeth without any edge whatever, so as to be able to pass by the teeth and go higher up. But even with this facilitation, we must abstain from applying wax or gutta-percha. As the removal of the impression is far more difficult than its insertion, we must, provided the substance be soft and yielding, be prepared to find it entirely out of shape, and we should also have a very imperfect impression of the teeth which are to serve as a support for the appliance, and whose very precise form we need. Should we, on the other hand, allow the substance used to become very hard, the danger would be great of not being able to remove it at all. In such cases, where the above-mentioned complications exist, we have no better material than plaster of Paris. It breaks on the outside of the teeth in removal, where it usually forms but a thin wall, and the parts can easily be attached in their several places by means of wax. In one case, however, even plaster could not be inserted, and I was obliged to sacrifice an incisor in order to obtain the requisite space. After having selected a suitable impression cup, and cut off the rim on the side where the teeth are, the other rim must be bent as much as possible outwardly in order thereby to secure an expansion of the buccal muscles, after which the desired quantity of plaster is inserted, taking care to pass beyond the teeth, so as to expand the mouth on the defective side. Should the contraction be so great as not to allow the desired quantity to be inserted at once, less must be used at first, and the rest carried in by the fingers, expanding thereby lips and cheeks as much as possible on the resected side. In like manner we proceed with the non-resected side where sufficient plaster is carried in by the fingers on both sides of the teeth in order to obtain an exact impression of them. When the plaster has hardened sufficiently, it will break off at the first attempt to loosen it, and the several pieces are carefully removed; while removing the buccal impression on the defective side, great care must be taken, turning and revolving as necessitated, in order to get beyond

the teeth. The impression should always be taken as far back as the uvula. After putting the several pieces together, the model is cast. The purpose of the artificial substitute is not only that of being an obturator, i. e., closing the hole that leads to the nose, but also that of restoring the face to its natural form and shape, and a simple plate would therefore not suffice. It must also be adapted for mastication. The next step, for this reason, would be the taking the bite of the lower teeth. A strong plate of gutta-percha is put on the model and pressed into clasps which are fitted accurately to the teeth on the non-resected side, so that the proof-plate may have a support in the mouth. The cavity in the gutta-percha is evened up to the desired height with wax and allowed to harden; then a small quantity of soft wax is added, until the under teeth, when biting against the upper ones, leave their prints on the wax on the resected side. Then the impression is taken from the under jaw, and, with the upper model, put in the articulator.

[To be continued.]

BOOKS AND PAMPHLETS.

DENTAL MEDICINE: A Manual of Dental Materia Medica and Therap tics for Students and Practitioners. By Ferdinand J. S. Gorgas.

This able work, by Prof. Gorgas, supplies a want long felt by the dental practitioner. It is to the dentist what the larger works of materia medica are to the physician. The wonder is that such a work, so complete and reliable, has not been published long ago. In addition to dental materia medica proper, it contains various tables, and a good deal of valuable matter conveniently arranged for reference. We cannot better give an idea of the plan and scope of the work than by quoting the "Table of Contents."

Preface: Introduction and Definitions and General Remarks—Action of Medicinal Substances—Important Points in Diagnosing Affections of the Mouth—Charateristic Indications of the Tongue—Abbreviations with Latin and English Terms—Approximate Measurements—Fineness of Powder—Weights and Measurers—Metric or French Decimal System of Weights and Measures—Rules for Regulating Doses—Table of Doses of all Officinal Medicines, Expressed in Terms of both the Apothecaries and the Decimal Metric System of Weights and Measures—Poisons, Symptoms and Antidotes—The Pulse—Pulsation per Minute at Various Ages—Respiration at Various Ages—Thermometers—Table of Elemetary Substances—Table of the Solubility of Chemicals in Water and Alcohol—Classification of Medicinal Substances—Definitions of the Various Classes of Medicinal Agents—Forms in which Medicinal Substances are Employed—Source, Derivation, Medical Properties and Action, and Therapeutic Uses of Medical Substances Em-

ployed in Dental Practice; Together with their Dental Uses and Application — Administration of General Anæsthetic Agents — The Dangers of Anæsthesia — Preventive Measures Against the Dangers of Anæsthesia — Treatment of Dangerous Symptoms of Anæsthesia — Methods of Resuscitation — Sylvester's Method — Hall's Ready Method — Local Anæsthesia — Topical Remedies — The Endermic Method — The Hypodermic Method — Setons and Issues — General Bloodletting — Local Bloodletting by Leeching — Cupping and Scarifications — Periods for the Eruption of the Teeth — Electricity as a Therapeutic Means in the Treatment of Disease.

In selecting nearly one hundred prophylactic and theraputic agents, the author has evidently taken great pains to give those whose value is well known, leaving the new and those yet undetermined still in the hands of the experimenter. More than two hundred and fifty dental formulas are given under the head of the principal ingredients composing them, thus making reference easy. We will not attempt to give all its good points. It is both an educator and an assistant in daily practice. No dentist can afford to be without it. It is a duty he owes himself and his patrons to own and consult it.

F. S.

A System of Oral Surgery: Being a Treatise on the Diseases and Surgery of the Mouth, Jaws, Face, Teeth and Associate Parts. By J. E. Garretson, M. D., D. D. S., Dean of the Phila. Dental College, Surgeon in charge of the Hospital of Oral Surgery, Member of the Phila. County Medical Society, Member of the Phila. Pathological Society, etc., etc. *Fourth edition. Thoroughly revised, with important additions.* 8vo. Published by J. B. Lippincott & Co., Phila.; London: 16 Southampton street, Strand. Cloth, $8. Sheep, $9.

It is not our present purpose to attempt a "review" of this most excellent work. Garretson's Oral Surgery is already too well and favorably known as authority throughout the dental world, and for its inestimable value to the profession, to render a simple review at all necessary, or even desirable. If we can assist in inducing every professional man to add a volume of it to his library, we shall enjoy the satisfaction of feeling that we have accomplished no small amount of good. Prof. Garretson has done everything within his power to make an absolutely reliable work; and that means a great deal. When an author, so accomplished and scholarly, can express himself as being even measurably satisfied with his work, having nothing more to add, the result must certainly be that which the rank and file of the profession will want to avail themselves of. We know of no work more essential to every practitioner. It is, in fact, of itself, a dental library, embracing almost every subject connected, directly or indirectly, with the practice of oral surgery. It is a volume of 1,002 pages, splendidly printed and bound, profusely illustrated by excellent steel plates and wood cuts—nine of the former and six hundred and sixteen of the latter; indexed by chapters, of which there are sixty-seven, and by general detailed subjects, comprising thirty-five double-column pages, besides seven double-column index pages of illustrations, making a volume of 1,060 pages.

"Exertion has increased to condense and simplify. Illustrations to the extent of seventy-five new cuts have been added. Every part of the volume has been rearranged, rewritten, or complemented.

The fact that this 'system' has come into common use by dental colleges makes desirable unexceptionable fullness in the direction of things considered by the specialty. Effort has been made to have no principles absent. Irrelevant matter is not present to perplex. The teachings and demonstrations being prepared specially for the guidance of students and practitioners of oral surgery, the author offers them as a result of thirty years of practice. Time has been taken for experimentation, for consideration and for execution. The responsibility has been continually in mind. The writer has done all he finds himself able to do."

Doubtless disagreement may exist in the minds of some of the co-laborers of Prof. Garretson relating to theories, as well as treatment and methods; but none will be more ready than such to join with the civilized world in according to him high honor for scientific attainment, honest and conscientious purpose, and as standing peerless as an operator in the specialty of which this volume is a treatise. If what he has thus advanced be truth, the propositions will take care of themselves, and he will be quite content to submit it to the test of time and the crucial scientific investigation of the future. At some future time we hope to notice some of the new chapters, especially those on inflammation and diagnosis.

S.

INTERNATIONAL REVIEW OF MEDICAL AND SURGICAL TECHNICS. Vol. I., No. 1. Edited by Joseph H. Warren, A. M., M. D., Charles Everett Warren, M. D., and Willard Everett Smith, M. D. Boston: International Medical Exchange.

This is a new quarterly journal, said to be the official organ of the American Association of the Red Cross, and a portion of its space is devoted to a statement of the objects of that Association, including an editorial, discussing the origin, progress and methods of its workings; also a copy of its constitution and a list of the national and associate societies of the Association, all of which makes an interesting and instructive account of one of the noblest charitable institutions in the world.

The remainder of the journal is made up mainly of clippings from foreign and domestic medical literature, describing new instruments and appliances, the methods of their use, and is valuable in that it furnishes to the practitioner of medicine and surgery a complete and exhaustive account of everything that is new and novel in his line of business. On the whole, we should deem this new aspirant for favorable notice a valuable addition to the list of medical periodical literature.

C. P. H.

WOMAN: An oration delivered before the American Academy of Dental Science. By Norman W. Kingsley, D. D. S. Boston, Nov. 7, 1883.

This is one of Dr. Kingsley's best efforts, and we propose some copious extracts in this or future numbers.

SECOND ANNUAL ANNOUNCEMENT OF THE COLLEGIATE DEPARTMENT OF THE CHICAGO DENTAL INFIRMARY.

"The Executive Committee and Faculty of the Collegiate Department of the Chicago Dental Infirmary, in making the announcement of its second annual course of lectures, are pleased to be able to state that the success attending the first course was greater than they had hoped for, and seems to warrant the belief that the plan advanced by this institution is a practicable one, which must eventually demonstrate its greater value as compared with those of other dental educational institutions.

From correspondence already had with various parties, the prospect is flattering that the coming class will be very much larger than the first. To those desiring to fully qualify themselves for the practice of dentistry, it is believed that this institution offers advantages not to be found elsewhere.

The founders of this institution recognize the necessity that every well-qualified dentist should have a good medical education, and believe that it can be more properly obtained in medical colleges, already established and fully equipped for imparting such education, than in any dental college. This institution therefore requires that its students shall obtain the degree of M. D., before presenting themselves at final examination for the degree of D. D. S., and the courses of lectures in this school are not expected to replace either of the courses required by the medical schools. Our students being thus required to spend three years in medical studies, the teaching in the dental school can be confined strictly to the subjects special to dentistry. The proportion of time devoted to lectures is therefore less, and that given to clinical instruction much greater than is usual in dental colleges.

COURSE OF LECTURES.

The course of lectures commences after the close of the regular courses in the medical schools, enabling students to pursue their dental studies during the interval between the sessions of the medical colleges.

The Faculty recommend that students take at least one course of medical lectures before matriculating in this institution.

The session will open on February 25, 1884, and continue twenty weeks.

Seats will be assigned students in the order in which they pay their fees, and they will be expected to occupy the same during the session.

REQUISITES FOR GRADUATION.

Candidates for graduation must be of good moral character, must have obtained the degree of M. D. from some reputable medical college whose diplomas are recognized by the Illinois State Board of Health, and must have attended two full courses of instruction in some reputable dental school, the last of which must be in this institution.

They must also have *attended 90 per cent. of the lectures* in this institution, and have been in attendance *90 per cent. of the time required in the clinical department*.

Students will also be required to be in attendance at the clinical department for one-half of the vacation, extending from the close of the session in this institution, to the beginning of the sessions in the medical colleges. For this purpose they will be divided into two classes—the first class to attend during the first half of the vacation, and the second during the second half.

They must also treat thoroughly some patient requiring all the usual dental operations, and under the eye of the demonstrator, or some member of the faculty, construct at least one practical, artificial case on metallic base; and they must undergo a satisfactory examination on all the branches taught in this institution."

LETTERS FROM A MOTHER TO A MOTHER ON THE FORMATION, GROWTH AND CARE OF THE TEETH. By the Wife of a Dentist, Mrs. M. W. J. Printed by Judson & Dunlop, Atlanta, Ga.

These "letters" have appeared in the columns of the *Southern Dental Journal*, of which we made editorial note in a recent number. They now appear in pamphlet form, 72 pages, and are a very valuable contribution to that class of literature that is needed to educate the public, especially mothers, on the subjects indicated by the title. The profession will do the public a "good turn" by aiding the general distribution of this work.

CONCERNING RECORDS. By Geo. L. Parmele, M. D., D. M. D., Hartford, Conn.

A neat reprint from the NEW ENGLAND JOURNAL OF DENTISTRY, of January, 1884.

A DIRECTORY OF THE PRACTICING DENTISTS OF THE STATE OF TENNESSEE. Prepared and issued under the supervision of Dr. Henry W. Morgan of Nashville.

TRANSACTIONS OF THE DENTAL SOCIETY OF THE STATE OF NEW YORK, 1882-3. Fourteenth and Fifteenth Annual Meetings.

Well edited, well printed, and full of excellent matter. We propose to copy some of it in future numbers of this journal.

A PHYSICIAN'S SERMON TO YOUNG MEN. By Wm. Pratt, A. M., M. D. Published by M. L. Holbrook & Co., New York.

Should be placed in the hands of every young man.

MONTHLY LIST OF PATENTS.

For Inventions relating to Dentistry and Surgery, bearing date Jan. 22, Feb. 26, and March 24, 1884. Reported expressly for this Journal by Louis Bagger & Co., Mechanical Experts and Solicitors of Patents, Washington, D. C.

291,571—Dental engine hand-piece. A. W. Browne, Pleasant Plains, New York.
291,714—Medical compound. D. A. Green, Scott, N. Y.
291,761—Medical compound. N. A. Lum, Carneiro, Kansas.
291,617—Surgical splint. H. McNaughton, Erin, Ontario, Canada.
291,690—Syringe. J. H. Clarke, Springfield, Ohio.
291,922—Preparing medicated court plaster. C. L. Morey, Comac, N. Y.

292,048—Apparatus for holding and moving invalids. C. F. Reed, Brooklyn, N. Y.
291,950—Veterinary medicine spoon. J. R. Stettheimer and T. Lois, Rochester, N. Y.
291,978—Artificial tooth. E. P. Brown, Flushing, N. Y.
291,946—Spring tooth. A. Shellman, Charleston, Mich.
293,502—Dental engine attachment. J. W. Norwood, Greenville, S. C.
293,501—Dental plugger. J. W. Norwood, Greenville, S. C.
293,739—Relining rubber dental plates. F. T. Hyatt, Norwalk, Ct.
294,286—Dental chair. E. P. Stiles, Austin, Texas.
294,288—Medical compound. G. Taylor, Redding, Cal.
294,667—Dental engine. E. R. Pettit, Philadelphia, Penn.
295,821—Dental vulcanizer. F. W. Seabury, Providence, R. I.

SOCIETIES.

THE NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society met on the evening of March 18th at the residence of Dr. Bödecker. The event of the evening was an address on "The Chemistry of Anteseptics and Disinfectants," by Prof. Chas. Mayr, of Springfield. The Professor spoke for more than an hour, holding the attention of his hearers throughout, and answering questions in such a manner as to give all the information sought, and also to reveal the fact that he was master of the subject considered.

J. M. H.

MAD RIVER VALLEY DENTAL SOCIETY.

The Mad River Valley Dental Society will hold its annual meeting in the parlor of the Phillips House, Dayton, Ohio, Tuesday, May 20, 1884. Sessions begin at 10 o'clock, A. M., 2 and 7 P. M.

Subjects for discussion:

1. The Value of Pulpless Teeth and Roots.
2. Inflammation.
3. Alveolar Abscess.
4. The Promotion of Osseous Development.
5. Facial Neuralgia.

The Dental Society of the State of New York will meet at Albany, Wednesday and Thursday, May 14 and 15. The Board of Censors will meet at the same place May 13.

J. EWD. LINE, *Secretary.*

SELECTIONS.

ON THE RELATIONS BETWEEN DENTAL LESIONS AND DISEASES OF THE EYE.

BY HENRY POWER, M. B. LOND., F. R. C. S.,

Opthalmic Surgeon at St. Bartholomew's Hospital, and Surgeon to the Royal Westminster Opthalmic Hospital, &c.

[Read at a meeting of the Odontological Society of Great Britain, November 5th, 1883, and reprinted from the Transactions of the Society.]

[Continued from page 81.]

A second case. Two lads sitting at the same desk. One presents a steel pen to the eye of the other, when his head is averted, and calls his name; he turns his head to the speaker, and the nib of the pen makes a punctured wound at the outer border of the cornea. A slight protrusion of the iris takes place. He continues his work, with gradually increasing irritation in the damaged eye, for three weeks, when suddenly vision in the second eye commences to be impaired. He is unable to accommodate his eye for near objects, and iritis sets in. The gravest anxiety is felt that total loss of vision will ensue, but fortunately this result was averted; by keeping the lad in perfect darkness for a month, and by appropriate local and general treatment, the reflex or sympathetic irritation gradually subsided, and by a singular piece of good fortune the injured eye also quieted down, and absolutely perfect vision was recovered in both eyes. This is an unusual result of sympathetic opthalmia.

It is, however, by no means necessary that irritation, even when it is very severe on one side, should necessarily radiate to the opposite eye, or to other nerves.

Curious cases sometimes occur, and it is as difficult to say why inflammation does arise in one case as it is why it does not occur in another.

About 1870 a man presented himself to me at the same clinic with severe injury of the eye, also from a piece of iron broken off the head of a rivet; the eye was laid open by the fragment, and vision was lost. I recommended removal of the globe. The man declined. He went to Maidstone. The surgeon—I believe, Mr. Adams—gave him, he said, the same advice, but he was determined not to have it done. He recommenced his work, and the eye gradually quieted down, but from time to time he suffered severe pain in it, and had to

discontinue work for some days; still the other eye remained strong. About two months ago, however, he called at the hospital, and he then had conjunctivitis and some impairment of vision in the healthy eye, whilst the opposite one was tender and painful. I exhorted him to have it removed. He reluctantly, and only after a week or two of deliberation, consented. In the operation for removal I met with a difficulty. After dividing the conjunctiva and muscles, I introduced a pair of scissors, but was unable to divide the optic nerve. Larger and longer scissors were tried, and it was only after considerable trouble that the globe was enucleated. The reason of the difficulty immediately appeared, for a large piece of metal was embedded in the optic nerve, just where it might be expected that it would excite sympathetic opthalmia, yet where it had remained for twelve years, with but slight effect on the opposite eye; for he made a good recovery, and was discharged on the 17th of October, 1883, and has had no trouble since.

If the question be put, How does the irritation or inflammation of one eye come to affect the other—by what path, or paths, does the irritation travel? the reply given, both by exact clinical observation and by pathological investigation, is that in the vast majority of cases there is a neuritis which travels along the ciliary nerves, but in a few instances along the optic nerves, and we shall see that this conduction of the morbid process along the sheaths of the nerve is of considerable importance in enabling some explanation to be given of the occurrence of reflex troubles where the teeth are the seat of the primary lesion.

Injuries affecting the branches of the first division of the fifth pair are well known to affect the eye of the same side, and there are good reasons also for believing that affections of other branches of the fifth pair of nerves may be the cause of opthalmic troubles.

In 1853, M. Decaisne, staff surgeon of the Belgian army, presented to the Academie de Belgique,* under the title of "Sur les dents œillières," a note on the disturbances of vision consequent on alterations of the teeth, in which he states that he saw an officer struck on the forehead with a piece of wood in the course of the frontal nerve, which caused complete blindness, and then remarks that it is not uncommon to see diplopia, or even complete loss of vision, supervene, either with or without ulceration of the cornea, as a result of disease of the maxillary sinus.

* "Bull. de l'Acad. Med. Belg.," T. XIII., 1853, and "Archiv. Med. Mil.," 1864.

That injuries to the supra-orbital nerve are occasionally followed by amaurosis seems to be well established. A case is recorded by Valsalva* of similar damage in which recovery is stated to have taken place. Unfortunately, however, in these cases the older authors had no means of knowing whether the deeper structures of the eye were injured or not. Some of the cases recorded might well have been accompanied by dislocation of the lens, by hemorrhage in or detachment of the retina, by crushing of the optic nerve in the optic foramen, and by other conditions which the invention of the opthalmoscope would now enable us readily to diagnose, and which can in no way be regarded as of a reflex nature. In one case, for example, the patient was thrown out of a wagon, and in another severely pecked by a turkey-cock. Severe blows and cuts over the brow and cheek may easily produce blindness by intra-ocular mischief, without causing any apparent damage to the surface of the eye. Thus Nossi† reports a case where a peasant was struck by a knife which cut the brow. M. Nicaise‡ states that he has on various occasions noticed the coincidence that exists between affections of the nasal fossæ and those of the eye. He believes he has thus been able to recognize a connection between the occurrence of nasal polypi and glaucoma, attributable to irritation of the many branches of the fifth pair which are distributed to the mucous membrane lining the nasal cavity. Demours§ gives a case of amaurosis supervening after extirpation, *secundem artem*, of a sebaceous cyst of the size of a hazelnut: the same evening inflammation of the eye supervened, and the next morning the eye was lost.

In 1870, M. Delestre published an essay on accidents following extraction of the teeth, and reports several cases which tend to prove the existence of visual troubles. He remarks that odontalgia is often accompanied with weeping and redness of the conjunctiva, with sudden darts of pain and winking of the lids. He considers that there is at first irritation of the branch of the dentary nerve supplying the affected tooth, and which is therefore one of the branches of the superior or of the inferior maxillary nerve. This irritation of one part of the fifth extends to other parts of the fifth, and particularly to the opthalmic, which leads to lachrymation, and redness of the conjunctiva.

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* "Dissert," II. and XI.
† Himly, i, 89.
‡ "Gaz. Med. de Paris," 1871, p. 150.
§ T. I, p. 173.

That the teeth and the eye may be concomitantly affected as the result of some widespread and general disease of the system, as in syphilis, Mr. Hutchinson's observations have made abundantly clear, though there is little doubt that some cases closely resembling those which he has so well and carefully described are the result of other conditions of the system than those appertaining to syphilis; at all events, they occur in children in whom no evidence of syphilis can be obtained from either parent.

I apprehend, however, that this is not exactly included in the subject on which I am about to speak to-night. My object is rather to bring before you some evidence of the occurrence of opthalmic affections as a consequence of dental disease. And the grand difficulty that I have met with in drawing any definite conclusions, is the extreme frequency with which dental affections present themselves. Thus, to take one affection alone, I was desirous of ascertaining whether dental caries and phlyctenular ulcer of the cornea stood to each other in the relation of cause to effect; but on examining the teeth of my young patients with phlyctenulæ, I found they all had carious teeth. It might be said, Is not that evidence that there is a close relation between the two affections? but, unfortunately for this view, the disease can readily be cured—in many instances—by the means usually adopted in opthalmic practice without the extraction of the offending teeth, so that they only fulfill half the old adage constituting a *vera causa*, "*præsens morbum facit, sublata tollit.*"

Having, however, established the existence of reflex irritation of the eye, it will perhaps be the best mode of treating of the various modes in which that irritation may express itself, if we consider it under the three following heads:

1. Reflex irritation affecting striated and unstriated muscle.
2. Reflex irritation affecting the mucous membrane and cornea.
3. Reflex irritation affecting the optic nerve and retina, and intra-ocular tissues.

In regard to reflex irritation affecting muscular tissues, we may mention—

1. Paresis of the ciliary muscle.
2. Paresis of the intra-orbital muscle.
3. Paresis of the muscular fibers of the iris.
4. Paresis of one of the ocular muscles.
5. Paresis of the orbicularis palpebrarum muscle.

One of the commonest forms of visual disturbance, induced by

dental disease, is *loss or failure of the power of accommodation.* By power of accommodation is meant the faculty which the eye possesses of adjusting its refraction so that well-defined images of objects situated at different distances from the eye may be formed upon the retina. This is accomplished, as is now well known, by the action of the ciliary muscle, which, by contracting, causes the lens to become thicker. For the lens is normally and, when the eye is at rest, covered anteriorly, and flattened by the anterior capsule, which is stretched by the suspensory ligament; but when near objects are fixed, the ciliary muscle is brought into play. This brings forward the anterior part of the choroid, and relaxes the suspensory ligament, and the lens immediately, by virtue of its own elasticity, becomes thicker, and is thus rendered capable of focussing divergent rays—that is to say, rays proceeding from near objects. The stronger the muscle, and the more elastic the lens, the greater is the degree of accommodation which can be effected; for, under these circumstances, the suspensory ligament can be thoroughly relaxed, and the lens can become highly convex. Hence, accommodation is strong, or has a great range, in children, extending from infinite distance to a point not more than three or four inches from the eye; for in them the ciliary muscle has great power, and the lens is very elastic. In advanced age, on the contrary, the muscle becomes feebler, and the lens is of firmer consistence and much less elastic. The suspensory ligament, consequently, does not undergo much relaxation, and the lens does not swell when the compressing influence of the anterior capsule is withdrawn. Hence the range of accommodation diminishes; distant objects, from which parallel, or approximately parallel, rays proceed, are still accurately focussed upon the retina; but any small object, to be clearly seen, must be held at a distance of ten to twelve or eighteen inches from the eye.

The influence of dental lesions on the accommodation has been particularly investigated by Dr. Hermann Schmidt, of Berlin. This observer examined the eyes of ninety-two patients, who presented themselves at his clinic, suffering from some form of dental disease—such, for example, as caries, periostitis, or neuralgia. Considerable pains was taken to determine the range of accommodation in both eyes, and to compare that on the sound with that on the unsound side; whilst reference was made to the tables of averages for each eye given by Donders. Amongst the ninety-two cases, Schmidt found there were only nineteen cases in which the range of accommodation was normal, or better than normal: in the remaining seventy-three cases the range was lowered, and in most instances considerably reduced.

[To be continued.]